5.3 The effect of grazing (cutting) and PGR application on grain yield of early sown wheat and comparison with May sowing - Nile, Tas

Location:
"Camperdown", Nile, Tasmania

Funding: GRDC

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Acknowledgements:
Michael Morrison for providing land and assistance; Rob Howard, Bec Fish, TIAR for technical assistance

Background/Aim:
A number of studies have evaluated the effect of grazing on subsequent grain yield and have compared plots sown at the same time. However grain yield from an early sowing may be lower than from a "traditional" May sowing as most Australian varieties have not been selected for an earlier sowing and are more prone to disease and lodging. It is therefore important to also compare yields of early sown grazed crops with a "conventional" May sowing. In previous trials the new winter wheat variety Revenue performed well with an early sowing (mid-March) without grazing whereas Mackellar lodged badly.

The objective of this study was to compare grain yields of early sown Revenue wheat (March) with grazed (cut) wheat sown at the same time and that sown at a more traditional time, May. The effect of a plant growth regulator (PGR) on uncut early sown plots was also evaluated.

Growing season rainfall (Mar-Dec):
594 mm plus 50 mm irrigation at establishment

Summary of findings:

- A replicated trial was conducted to compare grain yield of early sown Revenue wheat (cut and uncut for fodder) with that sown at a more traditional time, May.
- Both cutting and later sowing significantly reduced grain yield compared with the early sown uncut treatment.
- The most significant effect was the ability of the early sown plots to better tolerate the very wet conditions. With a root system actively depleting moisture from the soil profile in late autumn the early sown treatments entered winter with a depleted soil moisture bank whereas May sown plots struggled over winter due to additional water-logging.
- March sown plots that were cut did not recover as well as in drier seasons. It is likely that the prolonged water-logging created an additional stress on top of cutting to the detriment of crop recovery and grain yield.

Trial information:
Variety: Revenue
Treatments:

March sown:	Ungrazed without PGR
	Ungrazed with PGR
	Grazed (cut)
May sown:	Ungrazed

The earlier sowing date was on 24th March and that of the "traditional" treatment, 21st May and the trial followed a poppy crop. There were four replicates in a randomised complete block design with buffer plots to separate the different sowing dates. Prior to sowing 200kg/ha of single super was applied and at sowing a further 100 kg/ha of 24:4:13:4. Plot sizes were 10m x 1.5m wide. To reduce water-logging damage, nitrogen was initially applied as a foliar spray (12 kgN/ha) on 7 July. Two additional 50 kgN/ha topdressings were subsequently applied as urea. The PGR treatment received a Moddus/Cycocel combination at early stem elongation. To cover the large range of growth stages, four fungicides were applied across the trial (22 September, 28 October, 15 November (aerial) and 9 December), generally accompanied with an insecticide.

The "grazed" plots were cut by mowing on 24th May and 17th August prior to GS30. Soil moisture cores were taken at flowering to measure available water during grain fill. Quadrat samples were cut at flowering to measure biomass, height and green leaf area and prior to harvest to compare yield components. DM data is presented on an oven dried basis. Scores for lodging were also recorded at maturity. The trial was harvested on 27th January.

Results and discussion:
The season:
Irrigation and rainfall in March/April ensured good establishment of the trial. Although July was below average rainfall and August and September average, the high rainfall earlier in the year and in June (Decile 8-9) ensured the soil profile remained water-logged over much of winter and spring. Continued high rainfall over late spring and into summer ensured a good finish to the growing season. Of course then the season did not know when to switch off but fortunately harvest of the wheat and triticale plots was only delayed by about a week.

Growth and dry matter:

With good soil moisture, establishment of the early sown plots was optimal but water-logging in June and subsequent months reduced establishment in the May sown plots. DM production from the early sown cut plots was 0.8 and a further 1.4 t/ha from the May and August cuts respectively. Recovery from cutting of the early sown cut plots appeared to be reduced by the water-logging with relatively poor tillering. There was no significant difference between PGR treatments in DM and height at flowering (Table 1). Not surprisingly, cutting and later sowing reduced plant biomass and height. Uncut March-sown plots commenced flowering on 31st October. Cutting and later sowing delayed flowering by approximately 3 and 14 days respectively.

Grain yield:

Both cutting and later sowing significantly reduced grain yield compared with the early sown uncut treatments (Figure 1). There was no significant difference between PGR treatments in grain yield. Although not as severe as in the nearby European wheat variety trial, Septoria leaf blotch infection reduced green leaf area in the early sown treatments. In contrast the May sown plots remained green and disease-free. Yield component samples (ears/m^2, grains/ear and grain weight) are still being processed.

Table 1. Dry matter production (t/ha) and height of Revenue wheat from sowing date, cutting and PGR treatments, Nile, Tasmania 2010-11

Treatment	Total of DM cuts (t/ha)	DM at flowering (t/ha)	Height at flwr (cm)
March sown (-) PGR	-	19.4	93.3
March sown (+) PGR	-	18.7	90.5
March sown cut	2.2	12.0	83.0
May sown	-	7.9	79.5
l.s.d. (P=0.05)		**2.1**	**3.5**

The most striking soil moisture effect was the ability of the crop sown early to better tolerate the very wet conditions. With a root system actively depleting moisture from the soil profile in late autumn the early sown treatments entered winter with a reduced soil moisture content. Plants in these treatments tolerated the water-logging surprisingly well. In contrast plant growth from the May sown plots was visually poor and plants struggled over the entire winter and early spring. With early sown "grazed" plots, cutting in May/August appeared to add additional stress to plants and as in 2009-10 recovery after cutting was poorer than in previous seasons without water logging. There was no significant difference in soil moisture content between different treatments at flowering (data not presented). In a previous trial where cutting reduced the number of tillers/m^2 this resulted in significantly higher soil moisture content at flowering with more available for grain fill. It is likely the high rainfall in the 2010-11 growing season masked any such effects.

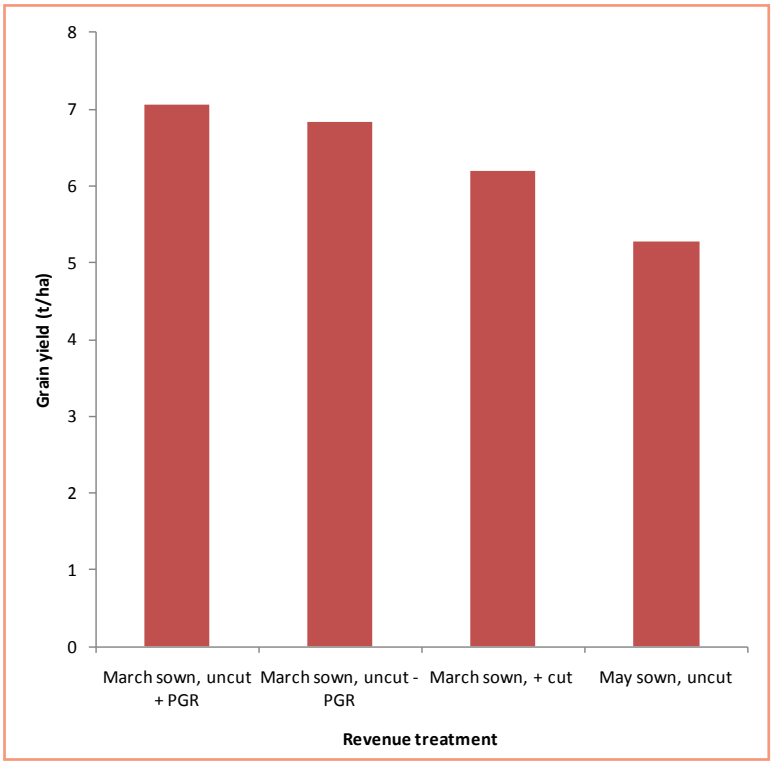

Figure 1: Effect of sowing date and cutting on grain yield of wheat (Revenue), Cressy, Tasmania, 2010-11. l.s.d. (0.05) = 0.61 t/ha.

Summary:

By drawing on moisture levels earlier in the season early sown crops provide a soil moisture buffer for wet winters. Of course this is contrary to the drier winters experienced more recently and "accepted" climate change outcomes. Nevertheless this strategy could be particularly important in grain crops following late irrigated vegetable crops.

With early sowing, diseases are likely to be more prevalent and a tighter fungicide program is required to ensure yield potential is achieved. Response to the PGR treatment just prior to stem elongation appeared to be reduced by the water-logged conditions at the time of application. A second application at flag leaf in an adjacent trial was more effective in reducing plant height and the incidence of lodging. With later flowering and increased stem strength a range of European wheats were evaluated at early sowing without grazing (see report in this book).